CDDIS UPDATE

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CDDIS OVERVIEW

The Crustal Dynamics Data Information System (CDDIS) is a dedicated data center supporting the international space geodesy community, providing easy and ready access to a variety of data sets, products, and information about these data. The data center was established in 1982 as a dedicated data bank to archive and distribute all Crustal Dynamics Project-acquired data and information about these data. Today, the CDDIS continues to serve as the NASA archive and distribution center for space geodesy data, particularly GPS, GLONASS, laser ranging, DORIS and VLBI data. The specialized nature of the CDDIS lends itself well to enhancement to accommodate diverse data sets and user requirements.

The CDDIS serves as one of the primary data centers for the following International Association of Geodesy (IAG) services:
- International GPS Service (IGS)
- International Laser Ranging Service (ILRS)
- International VLBI Service for Geodesy and Astrometry (IVS)
- International Earth Rotation Service (IERS)
- International DORIS Service (IDS)

The CDDIS has served as a global data center for the International GPS Service since its start in June 1992, providing on-line access to GPS data from nearly 200 GPS and 50 GLONASS sites on a daily basis as well as the products derived by the IGS Analysis Centers from these data. The CDDIS supports the following working groups and pilot projects within the IGS:
- International GLONASS Service Pilot Project (IGLOS-PP)
- IGS Densification Program
- Ionosphere Working Group
- Troposphere Working Group
- Low-Earth Orbiters Pilot Project (LEO-PP)
- GPS Tide Gauge Benchmark Monitoring Pilot Project (TIGA)

Operational and regional data centers deposit data to individual user accounts on the CDDIS host computer. All data are processed through UNAVCO's TEQC software to ensure data integrity and to extract pertinent metadata from the RINEX headers. These metadata are loaded into an Oracle database for data tracking and query purposes. Daily status files are also generated from the information contained in the RINEX headers.

The CDDIS is operational on a UNIX server with over 550 Gbytes of on-line disk storage. A majority of the archive is devoted to GPS data and products.

DATA FLOW FOR THE IGS
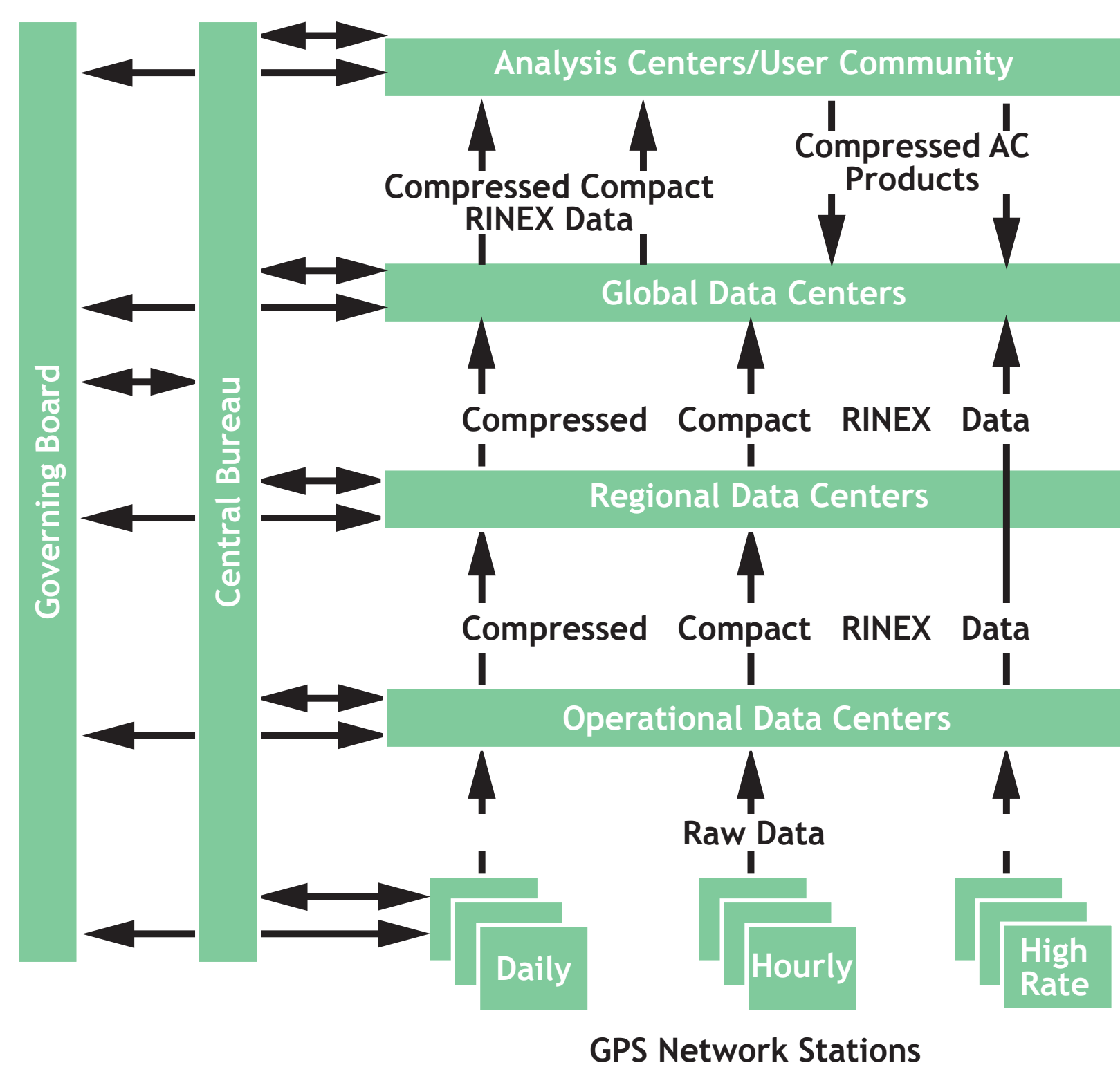
IGS DAILY, HOURLY, AND HIGH-RATE NETWORKS

IGS PRODUCTS AT THE CDDIS

Orbit, clock, ERP products
- Seven ACs
- Since June 1992 (GPS week 0649)
- Weekly precise combination, daily predicted and rapid combinations from AC Coordinator
- *ftp://cddisa.gsfc.nasa.gov/pub/gps/products/WWWW*
  - WWWW is 4-digit GPS week

SINEX products
- Seven ACs, two GNAACs, three RNAACs
- Since February 1996 (GPS week 0840)
- Weekly combination from Reference Frame Coordinator
- *ftp://cddisa.gsfc.nasa.gov/pub/gps/products/WWWW*
  - WWWW is 4-digit GPS week

Ionosphere products
- Working group product
- Global ionosphere maps of total electron content (TEC)
- IONEX format
- Daily files
- Five ACs
- Since June 1998 (GPS week 0960)
- *ftp://cddisa.gsfc.nasa.gov/pub/gps/products/ionex/YYYY/DDD*
  - YYYY is 4-digit year
  - DDD is 3-digit day of year
- *ftp://cddisa.gsfc.nasa.gov/pub/gps/products/ionex/YYYY/DDD/topex*
  - TOPEX ionosphere measurements
  - GPS broadcast ionosphere files
  - CODE Klobuchar model files
- *ftp://cddisa.gsfc.nasa.gov/pub/gps/products/ionex/YYYY/DDD/valid*
  - daily and weekly ionosphere model validation files

Troposphere products
- Working group product
- Combined zenith path delay (ZPD)
- Weekly files
- Weekly combination (from GFZ)
- Since January 1997 (GPS week 0890)
- *ftp://cddisa.gsfc.nasa.gov/pub/gps/products/WWWW/trop*
  - WWWW is 4-digit GPS week

IGS DATA AT THE CDDIS

GPS (and GLONASS) data (daily files):
- 30-second sampling
- ~0.35 Mbytes/site/day in size
- 200+ GPS (+ ~50 GLONASS) stations/day
- Data from 1997 through the present currently on-line
- Approximately 60% of daily data files delivered within three hours
- Data types:
  - O (RINEX observation data)
  - D (RINEX observation data, Hatanaka compression)
  - M (RINEX meteorological data)
  - N (RINEX broadcast ephemeris data)
  - S (output from TEQC)
- Daily combined broadcast ephemeris file created from all hourly nav files
- *ftp://cddisa.gsfc.nasa.gov/pub/gps/gpsdata/YYDDD/YYT*
  - YY is 2-digit year
  - DDD is 3-digit day of year
  - T is file type (O, D, M, N, S)

Near real-time GPS (and GLONASS) data (hourly files):
- 30-second sampling
- ~0.02 Mbytes/site/day in size
- ~116 regularly submitting (16 GPS/GLONASS)
- Approximately 60% of hourly 30-second data files delivered within fifteen minutes
- Retained for three days
- Creation of hourly combined broadcast ephemeris file started mid-2001; updated each hour with new navigation messages
- *ftp://cddisa.gsfc.nasa.gov/pub/gps/nrtdata/YYDDD/HH*
  - YY is 2-digit year
  - DDD is 3-digit day of year
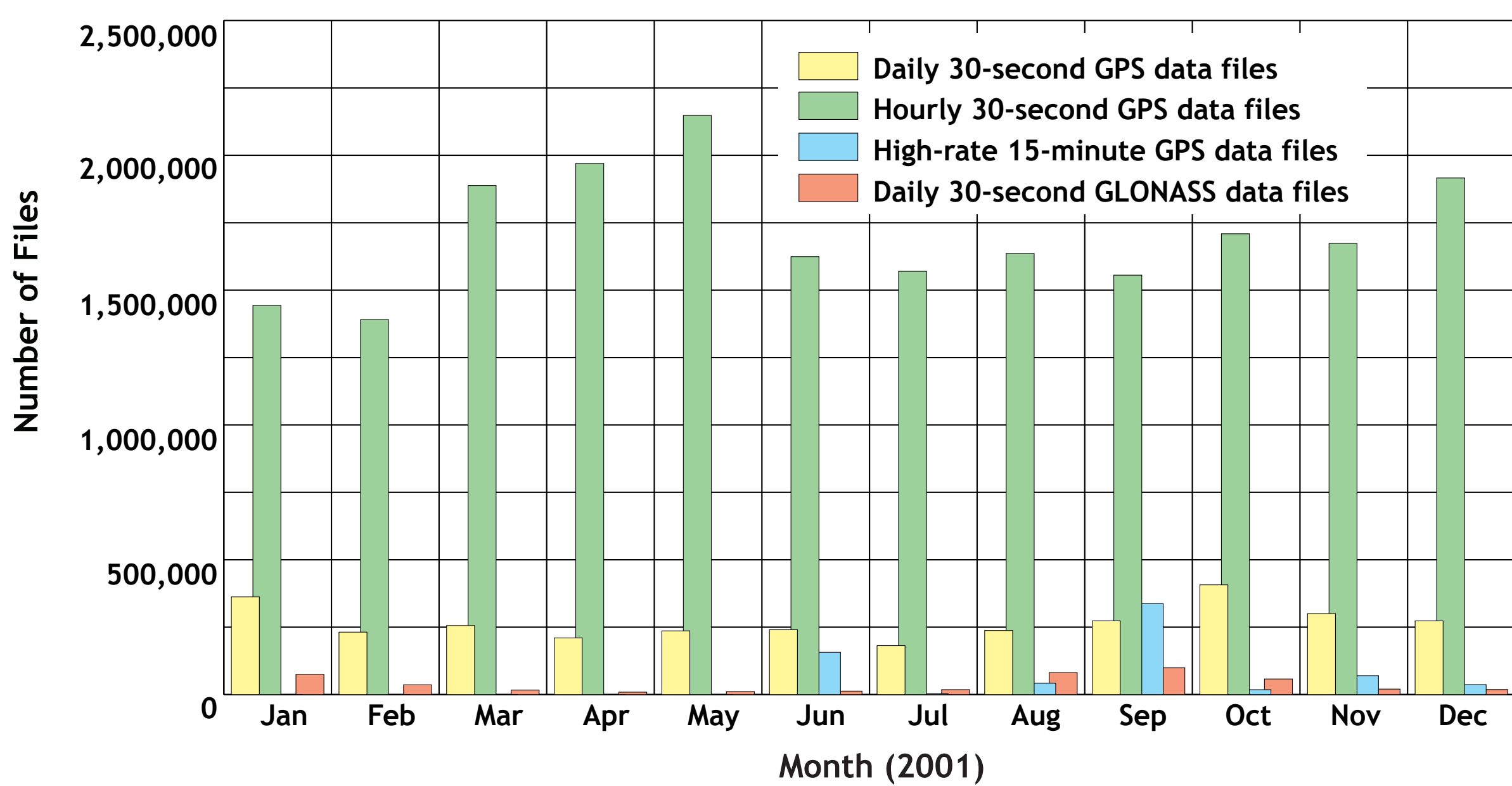 - HH is hour (00, 01, ... 23)

High-rate GPS data:
- 1-second sampling (typically)
- ~0.45 Mbytes/site/day in size
- 39 stations currently (from JPL, GFZ, GOPE, and ASI)
- Data in 15-minute files
- Since May 2001
- *ftp://cddisa.gsfc.nasa.gov/pub/gps/hrdata/YYDDD/YYT/HH*
  - YY is 2-digit year
  - DDD is 3-digit day of year
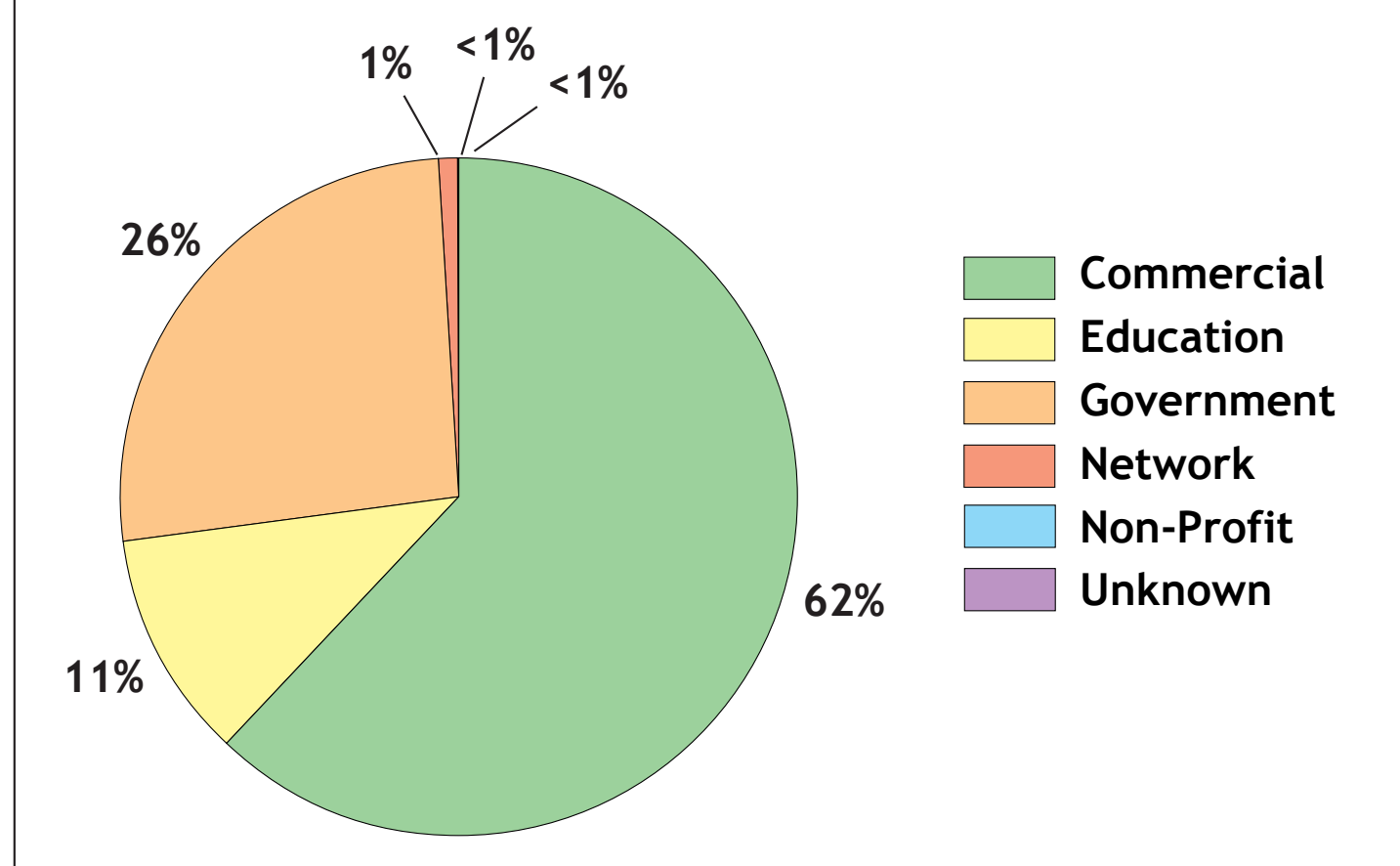 - T is file type (D, M, N)
  - HH is hour (00, 01, ... 23)

LEO GPS data:
- 10-second sampling
- ~2.5 Mbytes/satellite/day in size
- 3 satellites (SAC-C, CHAMP)
- Data in daily files
- Since January 2002
- *ftp://cddisa.gsfc.nasa.gov/pub/gps/leodata/SATNAME/YYDDD*
  - SATNAME is satellite name
  - YY is 2-digit year
  - DDD is 3-digit day of year

CDDIS ARCHIVE STATISTICS

Number of GPS and GLONASS Data Files Retrieved from the CDDIS in 2001

- Daily 30-second GPS data files
- Hourly 30-second GPS data files
- High-rate 15-minute GPS data files
- Daily 30-second GLONASS data files

Number of GPS Data Files Retrieved in 2001 (By Host Type)

- Commercial 62%
- Education 11%
- Government 26%
- Network 1%
- Non-Profit <1%
- Unknown <1%

Number of GPS Data Files Retrieved in 2001 (By Geographic Area)

- North America 57%
- South America <1%
- Europe 29%
- Asia 9%
- Africa <1%
- Australia 4%
- Pacific 1%
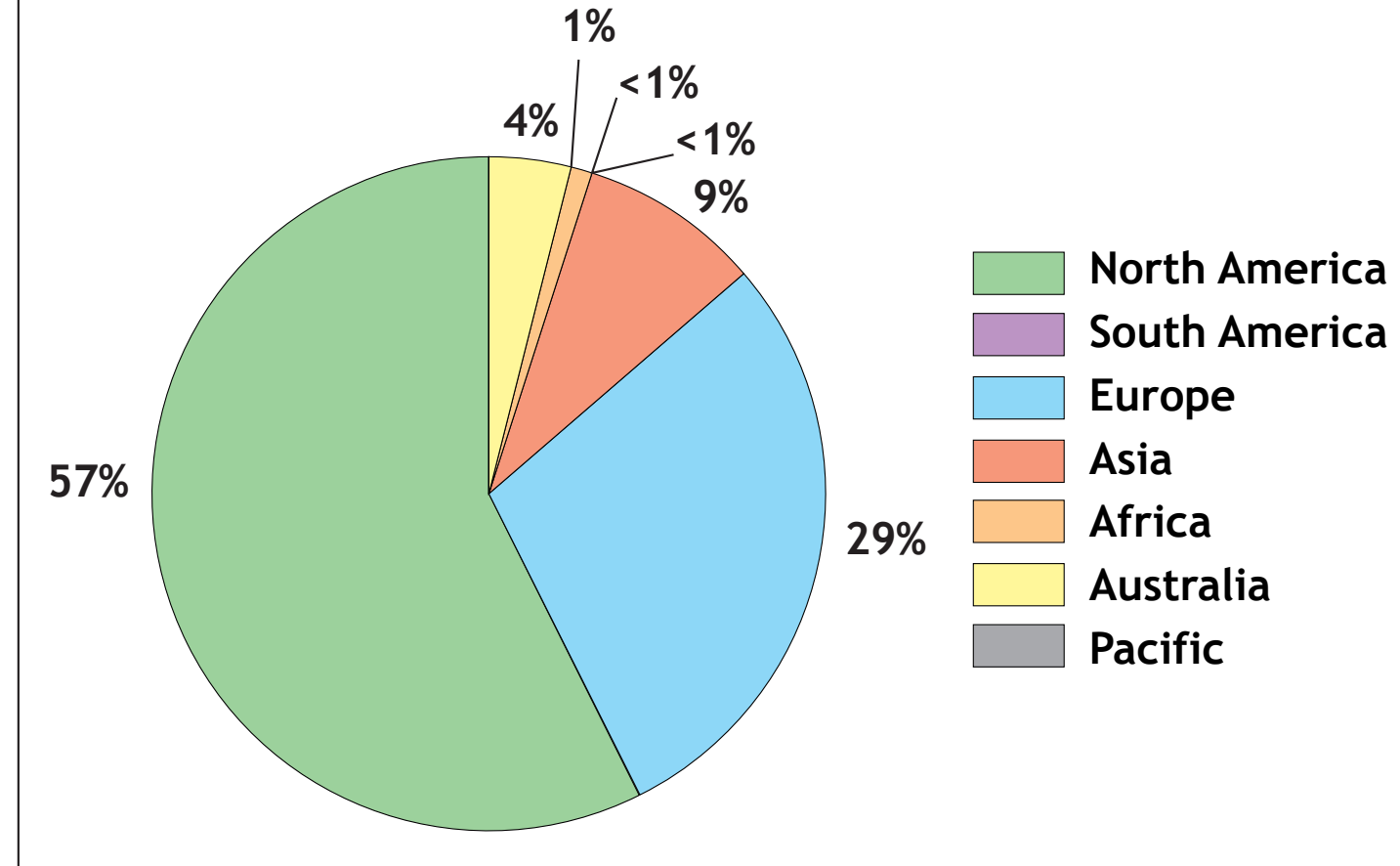
RECENT DEVELOPMENTS AND FUTURE PLANS

In May 2001, the CDDIS began supporting the IGS Low Earth Orbiter Pilot Project (LEO-PP) by archiving data from a network of approximately forty sites operating at a one-second sampling rate (typically). These data are available in files containing fifteen minutes of data stored in subdirectories by GPS day, hour, and data type. Starting in January 2002, the CDDIS LEO-PP archive expanded to include data from GPS receivers on-board the LEO satellites; currently data from SAC-C and CHAMP are stored in daily files, Hatanaka-compressed RINEX format, in subdirectories by satellite and day. In 2002, this satellite archive will be expanded to include data from ICESat and Jason. The CDDIS is also archiving CHAMP orbit products from associate analysis centers participating in a LEO-PP comparison project; thus far, results from twelve AACs have been received.

The CDDIS supported the Ionosphere Working Group's HIRAC/SolarMax campaign in April 2001. This week-long activity was organized to study the effects of the solar maximum on the Earth's ionosphere using a dense, high-rate GPS tracking network. Data from 104 sites in thirty countries totaling thirteen Gbytes in size were collected and archived.

The CDDIS now creates combined broadcast ephemeris files on an hourly basis from all archived hourly navigation files. This file, available at *ftp://cddisa.gsfc.nasa.gov/pub/gps/nrtdata/YYDDD/hourDDD0.YYn.Z* (DDD is the three-digit day of year, YY is the two-digit year), contains all broadcast messages with the TOE of the day DDD that are available when the file is created at the top of the hour. The file is updated each hour with new navigation messages. At the end of the UTC day, when the final version of the file is generated, the file is copied to the *ftp://cddisa.gsfc.nasa.gov/pub/gps/gpsdata/YYDDD/YYn* and */gps/gpsdata/brdc/YYYY* directories and becomes the "daily" broadcast ephemeris file (denoted as brdcDDD0.YYn.Z).

The CDDIS computer facility was upgraded with a new RAID disk system increasing the on-line disk storage to 470 Gbytes. A second RAID disk array will be purchased in 2002. A dedicated DLT system for system backups and off-line archive storage will also be procured this year.

FOR FURTHER INFORMATION

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